# PMT HV Base Prototypes Evaluation


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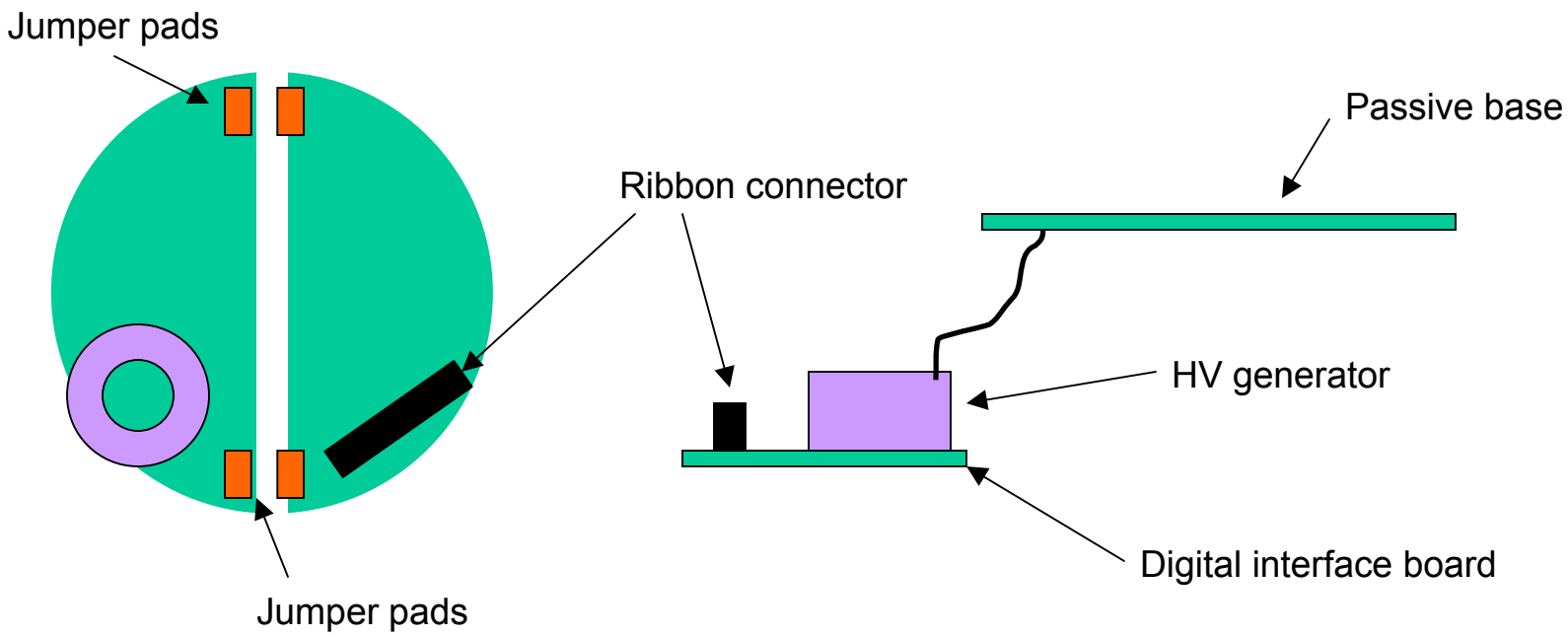
## Three prototypes

"Old Iseg"—Aug. 2002 prototypes

"New Iseg"—Split ground implemented.

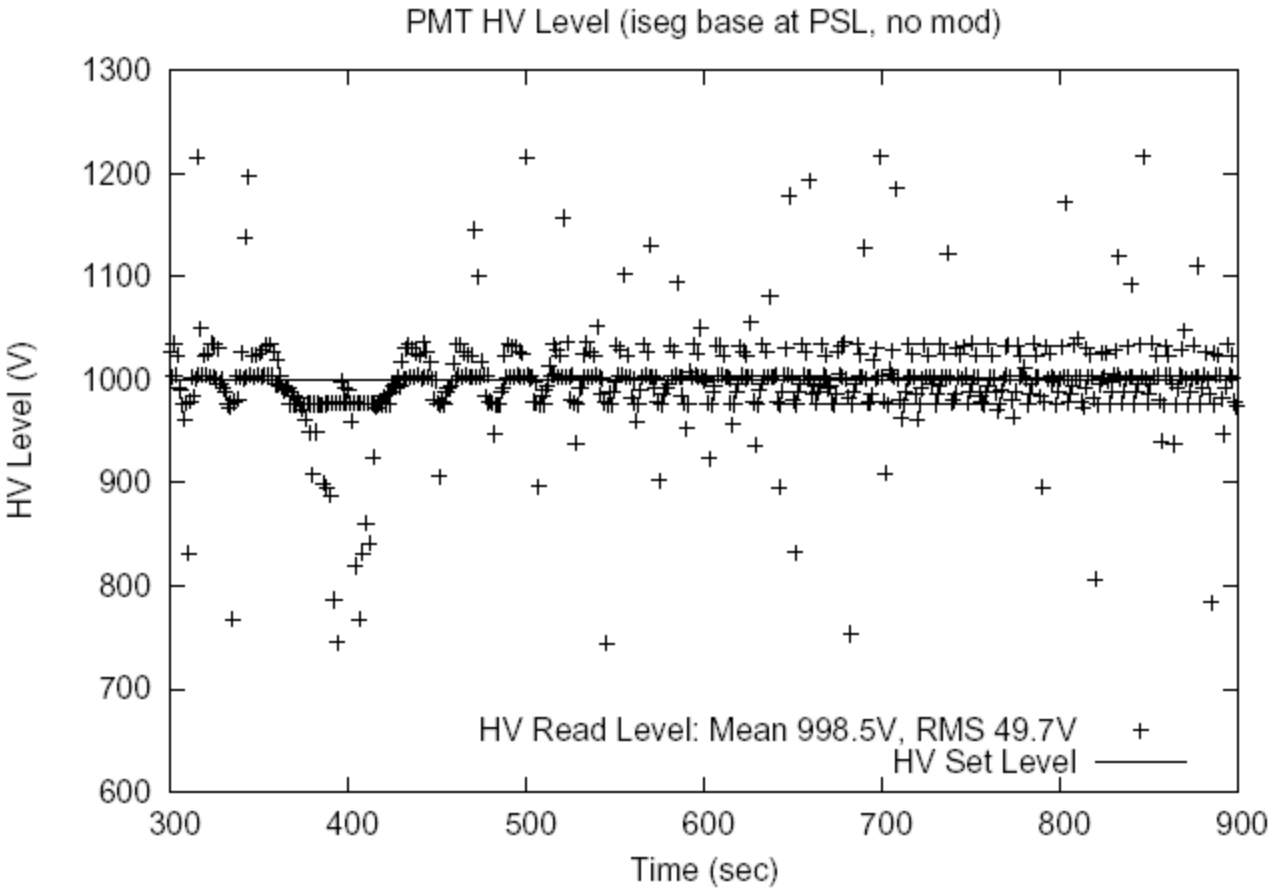
"EMCO"—Passive base approach consisting of three components:
Passive base, HV generator, & digital interface.

All designs present the same interface to DOMMB.



## New Iseg--Isolated Ground

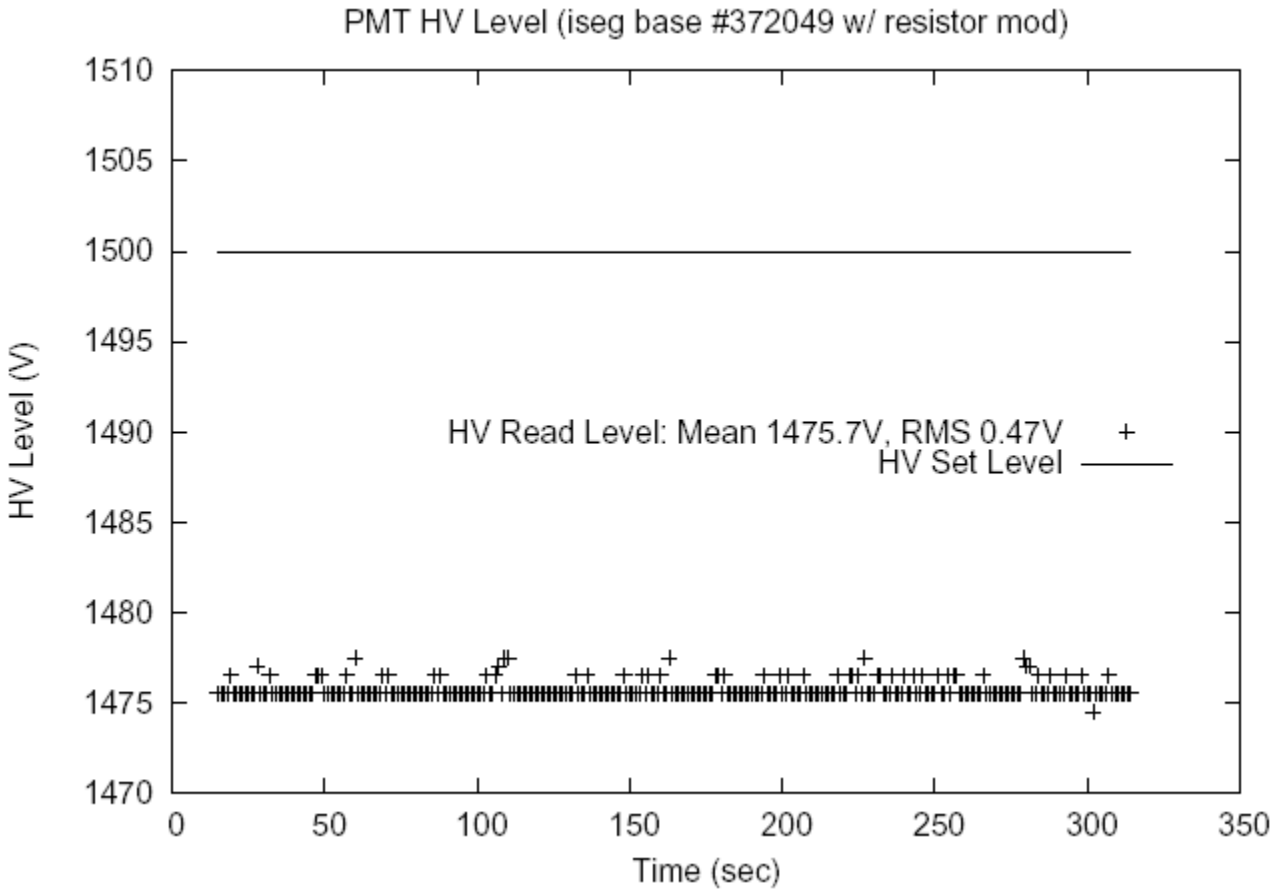
Output voltage is unstable with no ground-connecting jumper




Data by John Kelly
(hv_2000_iseg_psl.pdf)

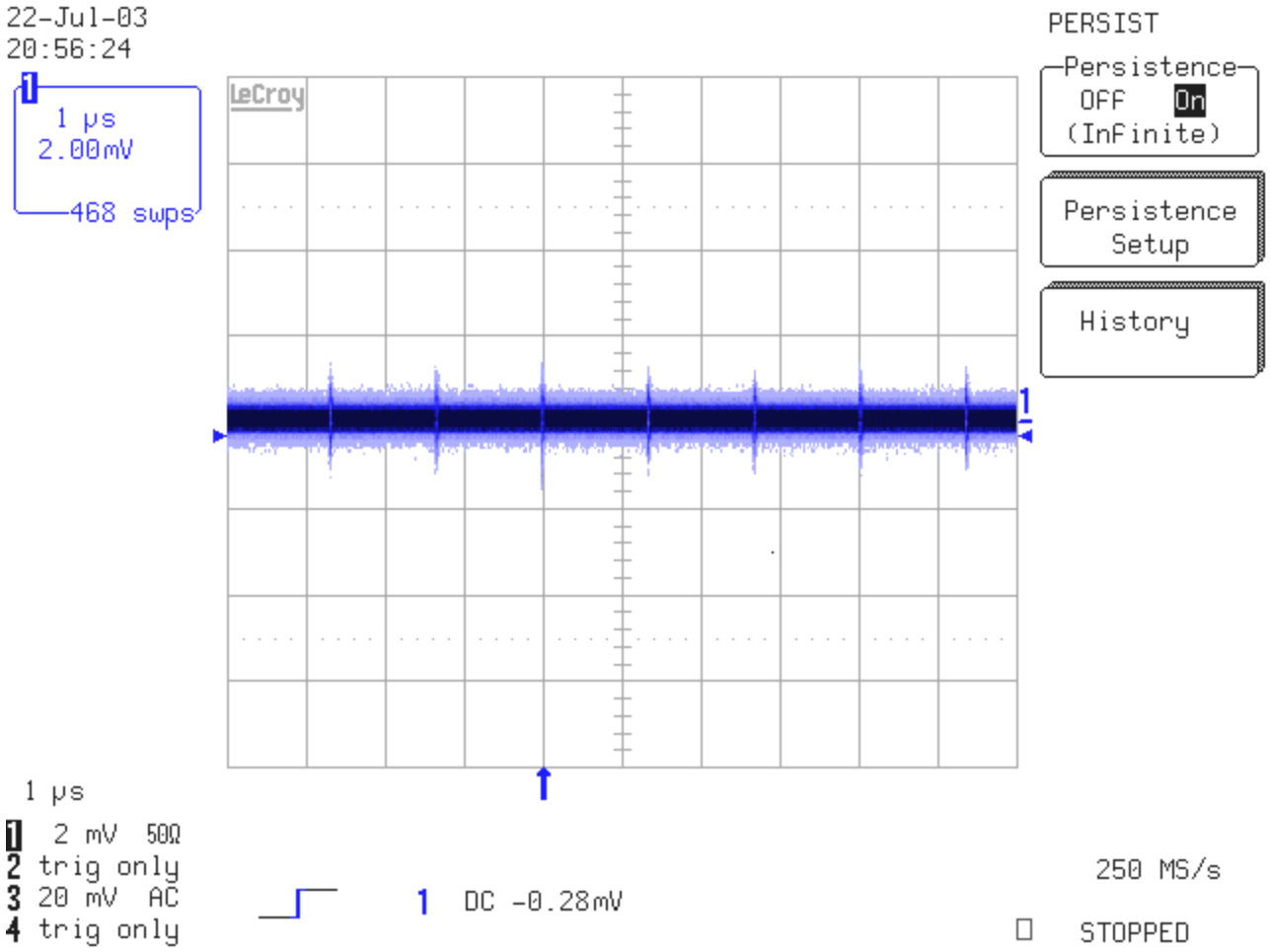
## New Iseg with a 1MΩ Jumper

The output voltage is stabilized by installing a jumper.

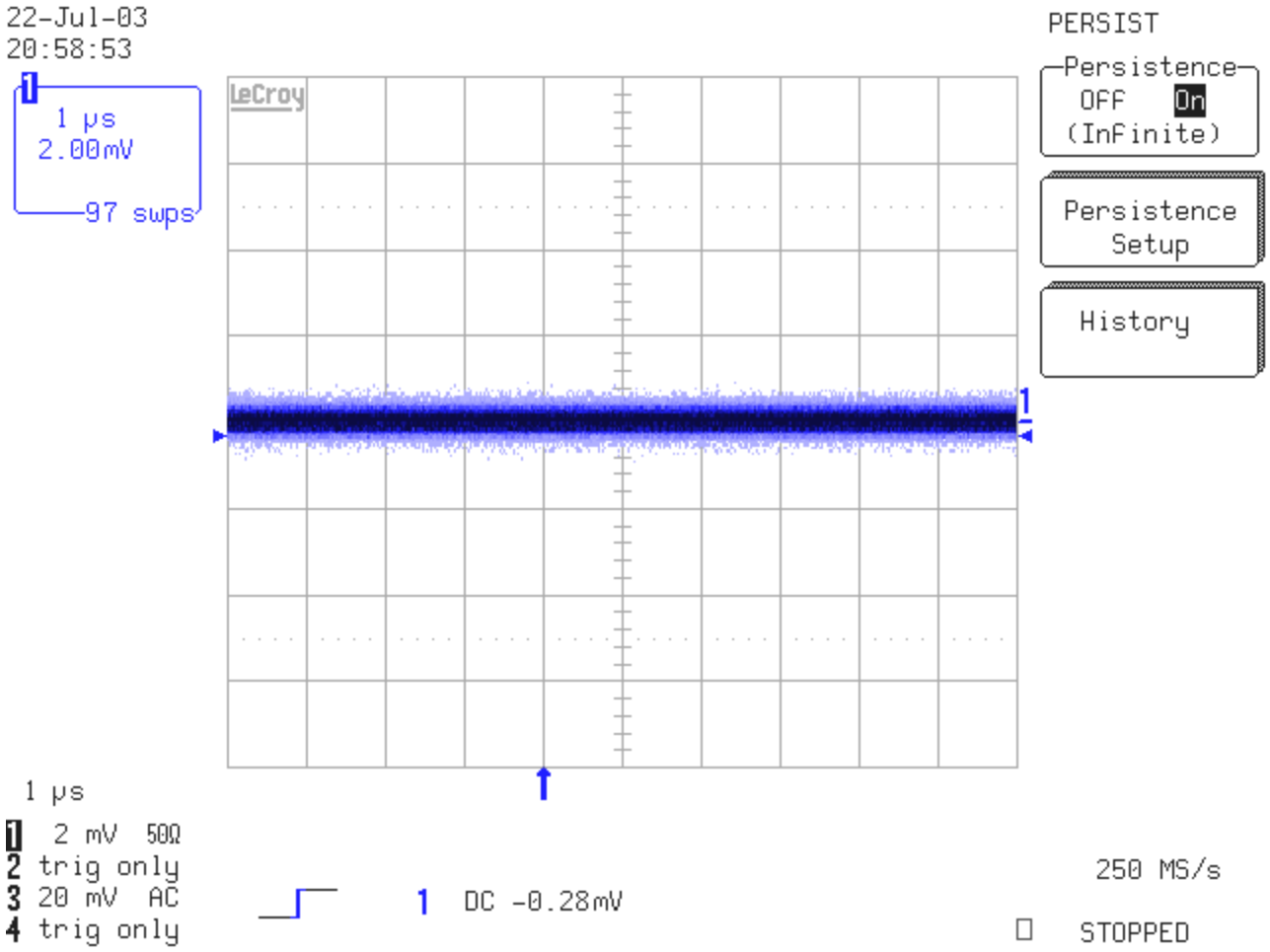



Data by John Kelly
(hv_3000_iseg_049.pdf)

# Connecting Grounds with a Zero Ω Jumper



# Connecting Grounds with a 1MΩ Resister

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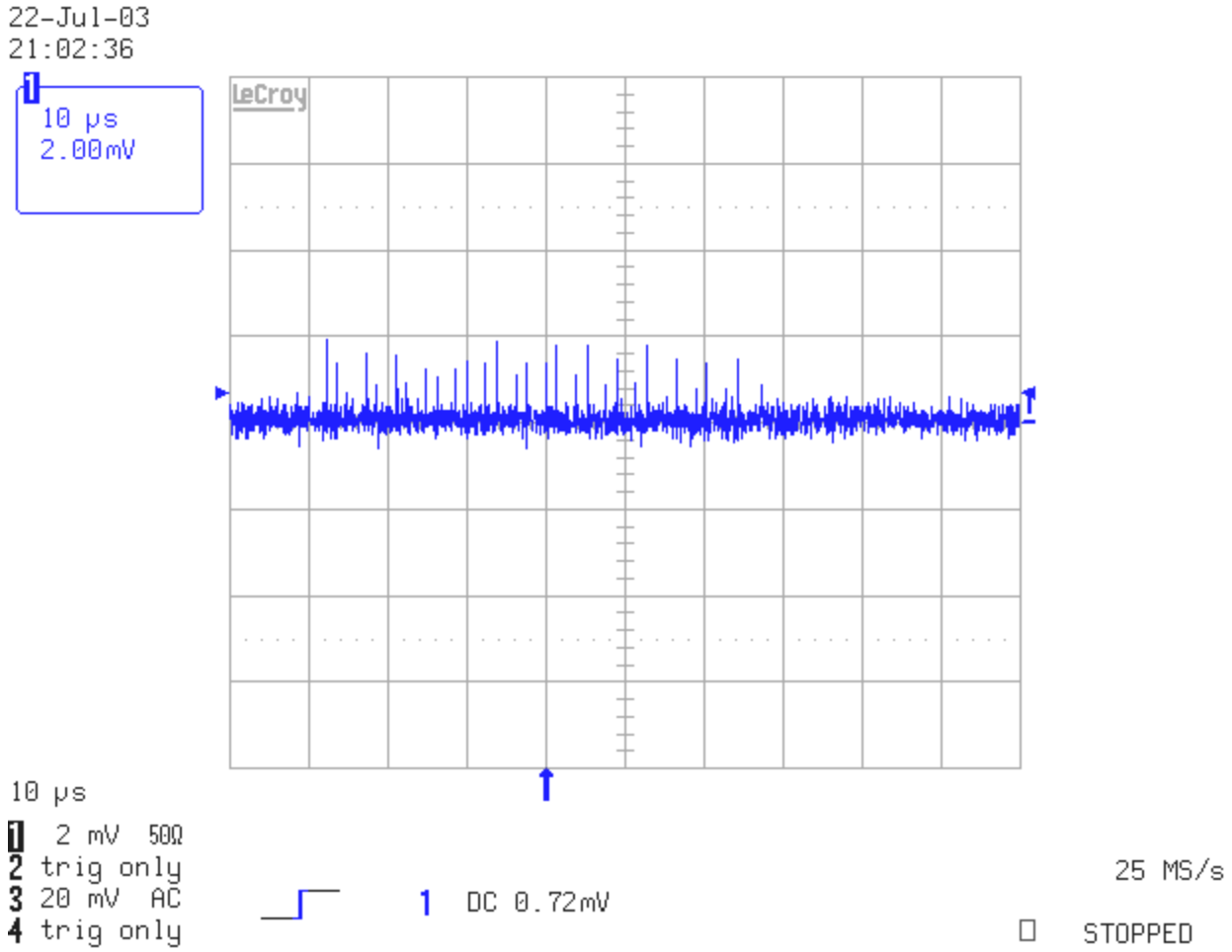
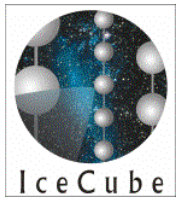
## Noise Introduced by Digital Communication

This example shows noise from reading the ADC on a new Iseg base with a 1MΩ jumper.





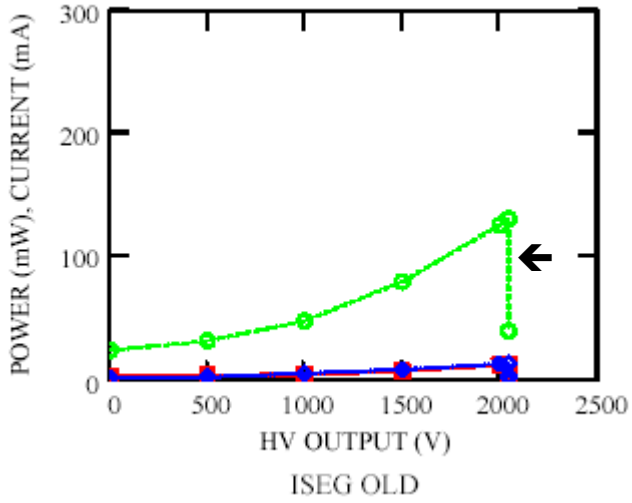

## Noise Comparison

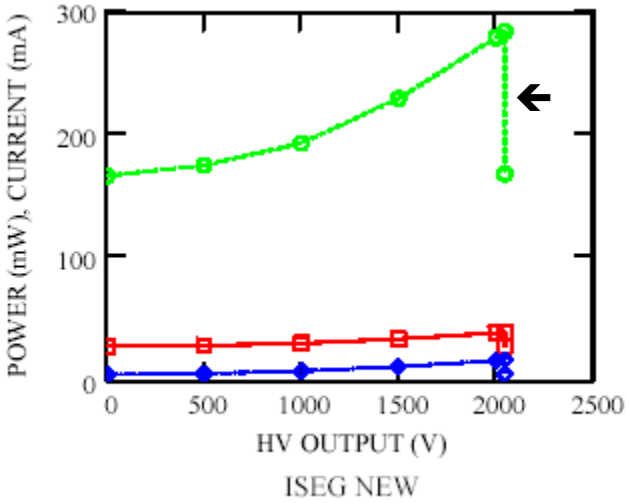
All the bases have similar random noise levels observed at the secondary side of the signal coupling transformer.

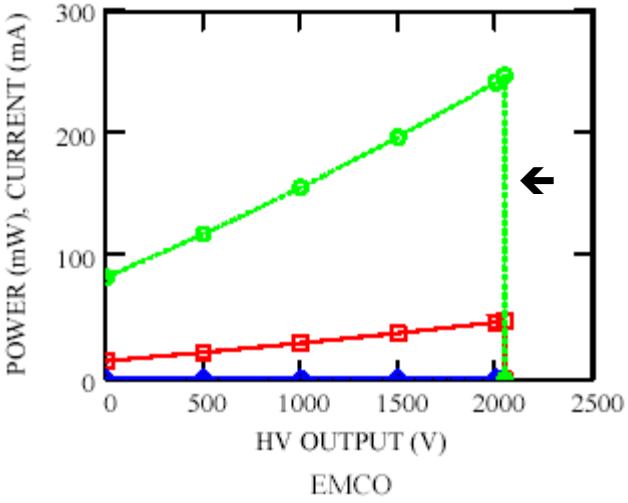
| | | ISEG OLD | ISEG NEW | EMCO |
|---|---|---|---|---|
| NOISE AT OUTPUT* | mVpp | 1.22 ± 0.13 | 1.26 ± 0.13 | 1.12 ± 0.21 |
| | μVrms | 214 ± 18 | 208 ± 18 | 215 ± 31 |

*At 50Ω oscilloscope input using a 50Ω cable. 100 nsec window (400 pts.)
The scope background is 1mVpp, 190μVrms over 100 nsec.

# Power Dissipation




POWER

CURRENT (+5V)

CURRENT (-5V)

"←" disableHV

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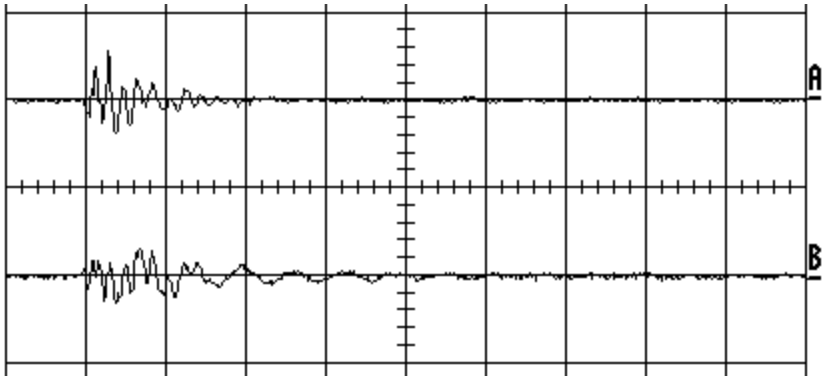
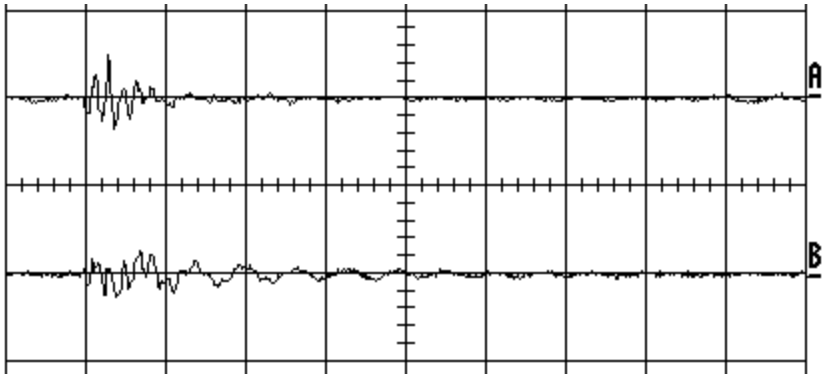
## Transient Power



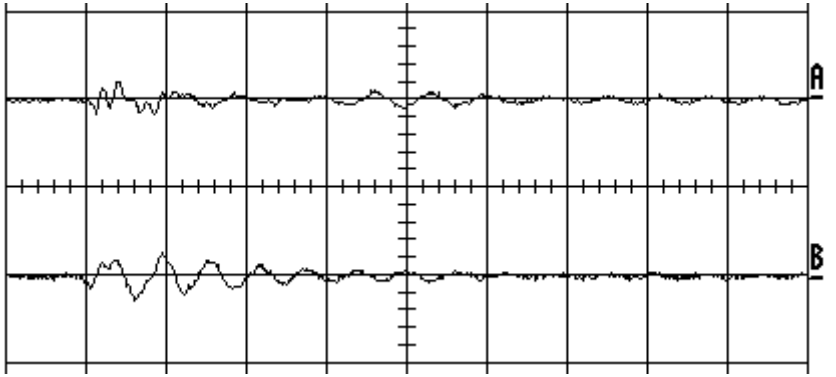

ISEG OLD

Enable after setting DAC to 4095.
Measure across 1Ω.
Trigger on “enableHV”



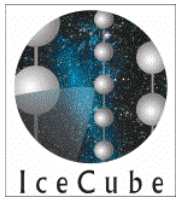

?

ISEG NEW




EMCO

0.5V, 50nsec




## Overall Comparison of the Three Prototypes

| | | ISEG OLD | ISEG NEW | EMCO |
|---|---|---|---|---|
| NOISE AT OUTPUT* | mVpp | 1.22 ± 0.13 | 1.26 ± 0.13 | 1.12 ± 0.21 |
| | μVrms | 214 ± 18 | 208 ± 18 | 215 ± 31 |
| 1ST DYNODE VOLTAGE | | FIXED (600V) | | SCALE WITH OUTPUT |
| POWER AT MAX OUTPUT (mW) | | 130 | 280 | 250 |
| COST (US$) | | ~150 | ~260 | ~600 |

*At 50Ω oscilloscope input using a 50Ω cable. 100 nsec window (400 pts.)
The scope background is 1mVpp, 190μVrms over 100 nsec.

## Conclusion

Old Iseg or New Iseg?

- New Iseg with isolated grounds performs badly
- New Iseg with directly connected grounds performs badly
- New Iseg with 1MΩ jumper performs very similarly to Old Iseg
- Old Iseg is cheaper than New Iseg
- Old Iseg consumes less power then New Iseg

➔Old Iseg

Iseg or EMCO?

- Both have similar noise levels
- Vdy1 is fixed in Iseg approach
- Iseg is cheaper than EMCO

➔Iseg